

April 29, 2005

Mr. Cliff Ives  
Sonoma County Department of Health Services  
Environmental Health Division  
475 Aviation Boulevard, Suite 220  
Santa Rosa, California 95403

**Re: Response to SCDHS-EHD Letter Regarding the Remedial Action Plan for the Wiggins Property, 3454 Santa Rosa Avenue, Santa Rosa, California, SCDHS-EHD Site #00001849, NCRWQCB Site # 1TSR007**

Dear Mr. Ives:

Winzler & Kelly Consulting Engineers (Winzler & Kelly) has prepared this response on behalf of our client, Wiggins Enterprises, Inc., to address comments outlined in the Sonoma County Department of Health Services, Environmental Health Division's (SCDHS-EHD's) April 18, 2005 letter (attached) regarding the above-referenced site. The SCDHS-EHD has agreed with the proposed remedial option (ozone sparging) as outlined in Winzler & Kelly's March 2005 Remedial Action Plan (RAP), however, is requesting additional information and details.

Listed below are the corresponding comments from the SCDHS-EHD's April 18, 2005 letter followed by Winzler & Kelly's response.

**Winzler & Kelly Response to SCDHS-EHD Comment No.1:**

**The Revised Section 1.5.1 Contaminants Present of the RAP will read:**

Contaminants present at this site originated primarily from a leaking gasoline UST and the associated piping. The site also had diesel fuel USTs, but may not have adversely contributed to the current release based on the groundwater sampling data. Specific compounds associated with this site is the gasoline release that includes benzene, toluene, ethyl benzene, and xylenes (BTEX), and lead scavengers 1,2-dichloroethane (EDC) and tert-butyl alcohol (TBA) are currently detected at the site. Historically, total petroleum hydrocarbons as diesel (TPH-D) and as motor oil (TPH-MO) have been reported in groundwater samples, however, the laboratory has noted that these concentrations as *"the sample chromatogram indicated that higher boiling point constituents of weathered gasoline are impacting the low boiling point range of diesel"* and *"the sample does not display a fuel pattern"*. Current groundwater analytical results from the site, and in particular from MW-5, have also been noted by the analytical laboratory that the reported diesel concentrations *"does not exhibit a chromatographic pattern characteristic of diesel. Higher boiling point constituents of weathered gasoline are present"*. Historical investigations have determined that there is limited presence of



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oxygenated compounds such as methyl tert-butyl ether (MTBE), di-isopropyl ether (DIPE), and TBA in the groundwater at the site. Although MTBE was commercially produced as early as 1979, the removal of the on-site gasoline UST (1986) predates the widespread use of oxygenated compounds.

TPH-D, TPH-MO, and total oil and grease (TOG) have been added to the list of analyses of impacted monitoring wells. The next routine sampling will include an analytical review of these compounds and determine if they are present in the groundwater. Please see the revised proposed groundwater monitoring and sampling schedule attached to this letter.

**The Revised Third paragraph of Section 1.5.3 Groundwater Contamination, of the RAP will read:**

For the March 2, 2005 sampling event (first quarter 2005), toluene, ethyl benzene, total xylenes, and MTBE compounds were all below the action levels in MW-5. Fuel oxygenates and lead scavengers have historically been detected in MW-5, but have also declined to non-detect except for the lead scavengers EDC and TBA at 1.7 and 46 µg/L, respectively. Toluene, ethyl benzene, and total xylenes were detected for the first time in well MW-9 during this sampling event at concentrations of 5.5, 2.0, and 9.8 µg/L, respectively. For this event, groundwater results from MW-5 exceeded the action level (AL) for TPH-G (AL of 50 µg/L) at 750 µg/L, EDC (AL of <0.5 µg/L) at 1.2 µg/L and TBA (AL of 12 µg/L) at 46 µg/L. Well MW-10 contained measurable free product for the third straight sampling event, ranging from 0.05 feet (4/29/04) to 0.15 feet (7/29/05) thick. Free product was measured in MW-10 during the most recent sampling event at 0.02 feet thick; however, the well screens were submerged by approximately 1 foot. MW-10 is screened from 5 to 20 feet bgs.

**The Revised Table in Section 2 - Proposed Cleanup Levels, of the RAP will read:**

CONSTITUENT	PROPOSED CLEANUP LEVEL	REFERENCE FOR CRITERIA
TPH-G	<50 µg/L	USEPA Taste and Odor Threshold is 5 µg/L, but detection limit is 50 µg/L and is controlling.
Benzene	<1 µg/L	Primary MCLs from Title 22, Section 64444 Organic Chemicals. Water Quality Objective.
Toluene	<42 µg/L	USEPA Taste and Odor Threshold, Federal Register 54(97): 22064-22138; applied Taste and Odor Water Quality Objective. There is a less stringent CA DHS Action Level of 100 µg/L applied to the Toxicity Water Quality Objective.
Ethyl benzene	<29 µg/L	USEPA Taste and Odor Threshold, Federal Register 54(97): 22064-22138; applied Taste and Odor Water Quality Objective; there is a less stringent CA MCL of 580 µg/L.

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CONSTITUENT	PROPOSED CLEANUP LEVEL	REFERENCE FOR CRITERIA
Xylenes	<17 µg/L	USEPA Taste and Odor Threshold, Federal Register 54(97): 22064-22138; applied Taste and Odor Water Quality Objective; there is a less stringent CA MCL of 1,750 µg/L.
Methyl tert-butyl ether	<5 µg/L	35 µg/L is USEPA health advisory for non-carcinogenic chronic exposure; applied Toxicity Water Quality Objective. 13 µg/L is the primary MCL, 5 µg/L is the secondary MCL.
Tert-butyl alcohol	<12 µg/L	12 µg/L is USEPA health advisory for non-carcinogenic chronic exposure; applied Toxicity Water Quality Objective. 12 µg/L is the primary MCL
1,2-dichloroethane	<0.5 µg/L	Primary MCLs from Title 22, Section 64444 Organic Chemicals. Water Quality Objective.

#### **Winzler & Kelly Response to SCDHS-EHD Comment No.2:**

On April 18, 2005, Winzler & Kelly contacted Clear Heart Drilling, Inc. (Clear Heart) that installed monitoring well MW-10. According to Clear Heart's job card, which lists the materials used, indicated that 20 feet of 2-inch PVC blank casing and 60 feet of 2-inch PVC screen were used to construct four wells, MW-9 through MW-12, and were each screened from 5 to 15 feet bgs. The previous documented well construction detail (screened from 10 to 20 feet bgs) presented by the former consultant was incorrect. Winzler & Kelly will verify the well construction during the next sampling event, currently scheduled for May 12, 2005.

In future monitoring events at the site, if the well screen is submerged (DTW less than 4.5 feet), the MW-10 will be purged so that the water surface is dropped below and into the screened interval to allow a representative monitoring of the presence of free product. Future quarterly monitoring and sampling reports will also have the historical groundwater elevation data summarized.

Based on the new information that well MW-10 is screened between 5 and 15 feet bgs, and that the abnormally high groundwater levels are not likely to continue, Winzler & Kelly recommends MW-10 not be reconstructed.

#### **Winzler & Kelly Response to SCDHS-EHD Comment No.3:**

Please see attached revised Site-Specific Ozone Sparge Point Installation Procedures. The drilling augers will be properly decontaminated between each boring/sparge point installation. Rinsate and soils generated from the decontamination process of the augers will be contained in drums prior to their characterization and disposal arrangement.

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**Winzler & Kelly Response to SCDHS-EHD Comment No.4:**

**The Revised Section 3.5 Remedial System Operations, of the RAP will read:**

Winzler & Kelly will operate the ozone sparge system in accordance with the manufacturer's recommendations and the guidelines set forth by the SCDHS-EHD. The SCDHS-EHD will be notified at a minimum of 48 hours prior to any testing or start-up. The remedial system start-up will commence at the start of the work week allowing a minimum of three consecutive days to balance the system under the oversight of the SCDHS-EHD. During system installation the SCDHS-EHS will also be notified of all scheduled delivery line pressure testing.

Prior to start-up, additional groundwater samples for a baseline will be collected and analyzed for potential degradation product, acetone, and oxidation by-products: bromide, bromate, dissolved-hexavalent chrome, vanadium, selenium, and molybdenum. These analyses are in addition to the routine sample collection outlined in the attached Table I - Proposed Groundwater Monitoring and Sampling Schedule.

After the system start-up and as directed by the SCDHS-EHD, for the first month Winzler & Kelly will perform weekly site visits to conduct required O&M and groundwater sampling for degradation products. Groundwater samples will be collected from wells: MW-5, MW-8, MW-9, and MW-10. If elevated levels of any of the analyzed parameters are identified, wells MW-11 and MW-12 will be added to the list. Additional weekly events will be conducted if analytical data warrants. After the first month, the weekly site visits will change to twice-monthly with groundwater sampling performed once a month. After the first quarter of monthly groundwater sampling for degradation products, sampling will be changed to quarterly, unless the site data warrants a continuation of the monthly groundwater sampling. Routine O&M visits for daily operation, system mechanical and balancing will continue on a twice-monthly schedule. System data sheets will be prepared for each site visit and include a written record of the maintenance service conducted. Attached is an O&M schedule of routine system checks and a schedule for mandatory part replacement provided by the manufacturer, Applied Process Technology, Inc. The manufacturer will be on contract to assist and aid in system maintenance assistance and repairs, if needed.

Analytical data from the routine quarterly groundwater sampling events will be used along with the baseline and subsequent sampling results to track the progress at the site. Scheduled O&M evaluation reports will be prepared and submitted quarterly and will include a summarization of groundwater analytical data, Time vs. Concentration plots for selected wells, and a written evaluation with recommendations.

The remedial system has an emergency shutoff on the exterior of the system enclosure, and an ozone detector integrated in the system unit with an automatic shutdown feature, inside the system enclosure. The sensor, an OEM Ozone Controller (model OEM-2) provided by ECO Sensors, Inc. detects leakage or emission of ozone associated with the connections or fittings of the ozone system unit. With this controller mounted inside of the system enclosure, it also can monitor the

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conveyance piping containing the Teflon delivery tubing and shut the system down if any ozone is detected. Ozone concentrations can be detected to low concentrations of 0 to 0.1 ppm. An instructions manual for the OEM Ozone controller is provided (see attached OEM Ozone Controller Product Manual).

It is anticipated that the operation of the ozone sparge system will operate continuously for a minimum of one year. Additional operation time will be based on site conditions, analytical data, and regulatory directives. A copy of the O&M manual will be obtained by Winzler & Kelly after the system start-up and O&M training has been completed. A copy will be forwarded to the SCDHS-EHD once received from the manufacturer. During routine site visits (O&M), if the automatic shutdown has occurred, then appropriate measures will be taken to find and correct the leak prior to returning the system into operation.

The RAP also provides for the provision for a mobile HVDPE system if additional free product is identified at the site during the proposed ozone sparge point installations. The operation of a HVDPE system would be provided by a specialty service vendor and is currently not scheduled. The HVDPE effort, if necessary, would operate independent of the ozone sparge system. The HVDPE system is a self-contained operation, where no site construction, other than possibly installing specially designed extraction wells. If necessary, the proposed initial scheduled event will comprise of one 15-day event.

#### **Winzler & Kelly Response to SCDHS-EHD Comment No.5:**

Winzler & Kelly will perform a special baseline sampling event prior to the installation of the ozone system on May 12, 2005 to include all additional parameters the SCDHS-EHD has requested. Post-installation and start-up of the ozone system, monitoring wells MW-5, MW-8, MW-9, and MW-10, located within the treatment area, will be sampled weekly for the first month and monthly for the first quarter, unless data indicates that additional or less sampling is warranted. If elevated levels of any oxidation by-products are identified, MW-11 and MW-12 will be added to the weekly/monthly events. Selected monitoring wells and domestic wells will be monitored and sampled on a quarterly basis as requested and as described in the attached revised Table 1. A remedial system start-up report will be submitted approximately 60 days after the start-up in order to include the first month of weekly sampling data, sparge point installations, and baseline analytical data.

#### **Winzler & Kelly Response to SCDHS-EHD Comment No.6:**

A revised proposed groundwater monitoring and sampling schedule is provided. Acetone, TPH-D, TPH-MO, and TOG has been added to the analysis of MW-5, MW-10, MW-11, and MW-12.

MW-12 is 65 feet crossgradient from MW-11, and MW-11 is approximately 90 feet downgradient from MW-10. Quarterly monitoring of MW-11 and MW-12 will serve as sentry wells during the site remedial activities.



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Well MW-9 will be monitored and sampled quarterly as well as the domestic supply wells within 750 feet of the site. These include domestic wells (DW-3415, DW-3450, DW-3455, and DW-3496) as described in the attached Table 1. As recommended in your letter, the onsite domestic well, once located, will be monitored and sampled for TPH-G, TPH-D, TPH-MO, BTEX, and fuel oxygenates and then properly destroyed by a licensed driller. A brief workplan will be submitted along with a health and safety plan, completed permit application, and appropriate fees prior to any well destruction activities.

Water supply well DW-3521 has been determined to be approximately 960 feet crossgradient from the site. Based on this distance (greater than 750 feet), it will not be included in the required quarterly monitoring and sampling events.

**Winzler & Kelly Response to SCDHS-EHD Comment No.7:**

Please see the attached revised Site-Specific Ozone Sparge Point Installation Procedures. The section has been revised to read:

Staff Geologist: An experienced staff geologist (SG) under the direction of a California Registered Geologist (RG) or Engineer (PE) will ensure that the ozone sparge points will be properly installed and oversee the logging of the borings. The SG will be responsible for complying with the procedures regarding installation of the ozone sparge points, collection of samples, containerization of samples, and documentation.

Should you have any questions or comments regarding this project, please contact David J. Vossler, Project Manager, at (707) 523-1010.

Sincerely,  
WINZLER & KELLY

David J. Vossler, PG, CEM, REA  
Environmental Project Manager

Kent O'Brien, PG, CEG  
Senior Project Geologist



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Attachments: SCDHS-EHD April 18, 2005 Letter  
Table 1 – Proposed Groundwater Monitoring and Sampling Schedule (revised)  
Historical Water Level Data for Well MW-10  
SOP Ozone Sparge Point Installation Procedures  
Service and Maintenance of the PulseOx 100  
Schedule for Mandatory Part Replacement  
OEM Ozone Controller Product Manual

c: Mr. Floyd Wiggins, Wiggins Enterprises, 1370 Airport Boulevard, Santa Rosa, CA 95403  
Mr. Scott Steever, Lanahan & Reilley, 3558 Round Barn Boulevard, Suite 300, Santa Rosa,  
CA 95403





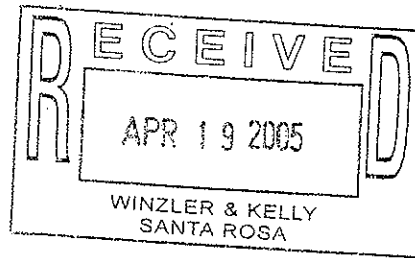
COUNTY of SONOMA  
DEPARTMENT OF HEALTH SERVICES

Rita Scardaci, MPH – Director  
Sharon Aguilera – Assistant Director

*Environmental Health Division*

Walter L. Kruse - Director

April 18, 2005



COPY

Floyd Wiggins  
Wiggins Enterprises  
1370 Airport Blvd.  
Santa Rosa, CA 95403-1009

Re: 3454 Santa Rosa Avenue, Santa Rosa, CA — Leaking Underground Storage Tank Site  
SCDHS-EHD Site # 00001849, NCRWQCB Site # 1TSR007, SWRCB Cleanup Fund #1146  
Review of *Remedial Action Plan and System Design* (Winzler & Kelly, March 2005)

Dear Mr. Wiggins:

This Department received the referenced document on March 22, 2005. The Remedial Action Plan (RAP) to remediate the site with Ozone Sparging and limited Dual Phase Extraction has been reviewed by staff. The plan appears generally well prepared, however, additional detail is required prior to acceptance by this Department. Please note the comments regarding the RAP as follows:

1. Section 1.5.1 must address diesel oil, motor oil, total oil and grease, and tert butyl alcohol. The contaminants have been reported on site and remain chemicals of concern. Please also refer to the third paragraph of Section 1.5.3 and Section 2.0 which will require modification.
2. Section 1.5.3 discusses free product and its removal in MW-10. Upon review of the screen interval data and the historically reported groundwater depths, it is apparent that this well screen interval is not satisfactory for the reporting and removal of free product. Because this is a key well for monitoring groundwater contamination, it will be required to reconstruct this well with an appropriate interval. An addendum to the RAP detailing the reconstruction of this well and a drilling permit application with fee must be submitted for review.
3. Section 3.2.1 regarding the sparging point installation must include provisions for auger decontamination and for handling and disposal of potentially contaminated soil.
4. Further detail must be included in Section 3.5 regarding system operation and maintenance. A maintenance schedule must be included. Please note that system startup must be done early in the work week so that it can be monitored at a minimum for the first three consecutive days with this Department's oversight. As part of the system operation and maintenance, approved air monitoring equipment must be used to monitor potential ozone releases to the environment. You are required to notify this Department at least 48 hours before testing the system integrity and before system startup. Please also refer to the last paragraph on page 3, and to page 5 of Appendix C.
5. Section 4.0 must include a provision to sample monitoring wells within a week of startup. Initial results must be reviewed immediately for indications of increased contaminant

mobilization in groundwater. Marked increases in contaminant levels upon system startup must be reported immediately to this Department. Baseline and initial groundwater sampling results must be included in a RAP startup report.

6. The Table 1 proposed sampling schedule is not acceptable. The following modifications are required:
  - Acetone, TPHd, TPHmo, and total oil and grease must be included as analytes in the key monitoring wells MW-5, MW-10, MW-11, and MW-12.
  - MW-12 is 65 feet away from MW-11 and will require its own quarterly sampling with the added analytes required for ozone treatment monitoring.
  - Quarterly sampling of MW-9 is required because of reported VOCs in the March 2, 2005 samples.
  - Sampling of water supply wells within 750 feet of the release remains required quarterly since there is a potential to mobilize contaminants. These wells include DW-3415, DW-3450, DW-3455, DW-3496 and the onsite well when located. As noted in this Department's September 19, 2002 letter, the status of this well and its intended use must be determined and reported. It is this Department's recommendation to destroy this well under permit of the Sonoma County Permit and Resources Department since it is a potential conduit of contamination to a drinking water aquifer.
  - Verify and correct, if necessary, the statement that the water supply well DW-3521 is over 2000 feet cross gradient of the site.
7. Appendix B, Section 3 is misleading. The remediation of the site must be done under the responsible charge of a Professional Engineer or Registered Geologist.

**June 18, 2005** is established as the due date for submittal of a supplement to the RAP addressing the items noted above. Review of the RAP supplement will be expedited so that remediation can begin as soon as possible.

A Drilling Permit Application and fee to install the sparge points, and a Site Safety Plan have been received on April 11, 2005. The permit application is found acceptable and will be approved upon final Department concurrence with the RAP.

Please be advised that as of December 16, 2004, the following additional electronic submittals must be uploaded to the State Geotracker database as required by Title 23, Division 3, Chapter 30, Article 2, Sections 3890-3895 of the California Code of Regulations:

- Depths of screened intervals and lengths of screened intervals for any permanent sampling points,

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- Boring logs (PDF format), and
- Complete copies of reports including the signed transmittal letters and professional certifications (PDF format).

The referenced report has not been submitted as of this date. Information on electronic reporting can be found on the State Water Resources Control Board web page:  
[http://www.waterboards.ca.gov/ust/cleanup/electronic\\_reporting/](http://www.waterboards.ca.gov/ust/cleanup/electronic_reporting/).

The State Cleanup Fund has discontinued its preapproval process because of a staffing shortage; however, reasonable and necessary costs should be eligible for reimbursement. The site must be in compliance with this Department's directives to be eligible for funding.

Your continued effort to investigate and remediate this site is highly valued. Please write or telephone (707) 565-6574 if you have any questions regarding the additional site requirements.

Sincerely,



Cliff Ives  
Senior Environmental Health Specialist  
Leaking Underground Storage Tank Local Oversight Program

CI

- c: Mr. Luis Rivera, North Coast Regional Water Quality Control Board  
Mr. David Charter, SWRCB Cleanup Fund  
Mr. Kent O'Brien, Winzler & Kelly, 495 Tesconi Circle, Santa Rosa, CA 95401

**Table 1. Proposed Groundwater Monitoring and Sampling Schedule**

Wiggins Property  
3454 Santa Rosa Avenue, Santa Rosa, California

Monitoring Well ID	Current Sampling Frequency	Recommended Sampling Frequency	Recommended Analysis	Basis for Monitoring
MW-5	Quarterly	Quarterly	TPH-G, -D, -MO 8015M, BTEX Olys 8260B, TOG 418.1M DO, ORP, pH	Monitors impacted area. Additional sampling as follows: Baseline, weekly, monthly and quarterly as required; acetone, bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-6	Semi-Annually	Annually (4th quarter)	TPH-G, 8015M, BTEX, Olys 8260B, DO, ORP, pH	Will serve as an early warning detection well for DW-3450. Quarterly groundwater elevation monitoring.
MW-7	Semi-Annually	Annually (4th quarter)	TPH-G, 8015M, BTEX, Olys 8260B, DO, ORP, pH	Upgradient, historically non-detect. Quarterly groundwater elevation monitoring.
MW-8	Semi-Annually	Quarterly	TPH-G, -D, -MO 8015M, BTEX Olys 8260B, TOG 418.1M DO, ORP, pH	Will serve as an early warning detection well for DW-3496. Additional sampling as follows: Baseline, weekly, monthly and quarterly as required; acetone, bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-9	Quarterly	Quarterly	TPH-G, -D, -MO 8015M, BTEX Olys 8260B, TOG 418.1M DO, ORP, pH	Historically non-detect except for 1st quarter 2005, where low vocs were detected. Additional sampling as follows: Baseline, weekly, monthly and quarterly as required; acetone, bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-10	Quarterly	Quarterly	TPH-G, -D, -MO 8015M, BTEX Olys 8260B, TOG 418.1M DO, ORP, pH	Monitors impacted area. Additional sampling as follows: Baseline, weekly, monthly and quarterly as required; bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-11	Quarterly	Quarterly	TPH-G, -D, -MO 8015M, BTEX Olys 8260B, TOG 418.1M DO, ORP, pH	Downgradient and off site, and will serve as an early warning detection well for DW-3415 and DW-3455. Additional sampling as follows: Baseline and quarterly; bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-12	Quarterly	Quarterly	TPH-G, -D, -MO 8015M, BTEX Olys 8260B, TOG 418.1M DO, ORP, pH	Historically non-detect and close to MW-11. Additional sampling as follows: Baseline and quarterly; bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum
DW-3415	Quarterly	Quarterly	TPH-G 8015M, BTEX, Olys 8260B DO, ORP, pH	Petroleum related constituents not detected on April 29, 2004. The well is located downgradient of monitoring wells MW-11 and MW-12 approximately 320 feet.
DW-3450	Quarterly	Quarterly	TPH-G 8015M, BTEX, Olys 8260B DO, ORP, pH	Petroleum related constituents not detected on May 6, 2004. The well is located approximately 80 feet upgradient of the contaminated area.
DW-3455	Quarterly	Quarterly	TPH-G 8015M, BTEX, Olys 8260B DO, ORP, pH	Petroleum related constituents not detected on April 29, 2004. The well is located approximately 360 feet downgradient of monitoring wells MW-11 and MW-12.
DW-3473	Quarterly	Discontinue Sampling		DW-3473 is inoperable and cannot be sampled. Located approximately 720 feet downgradient of the site.
DW-3496	Quarterly	Quarterly	TPH-G 8015M, BTEX, Olys 8260B DO, ORP, pH	Winzler & Kelly will seek permission to sample the well during the next quarterly sampling event, however, previous attempts to gain access has not been granted in the past. Well is located approximately 440 feet cross gradient of the site.
DW-3521	Quarterly	Discontinue sampling		This well is located approximately 900 feet crossgradient of 3454 Santa Rosa Avenue property.

## Historical Water Level Data for Well MW-10

Wiggins Property  
3454 Santa Rosa Avenue, Santa Rosa, California

Well ID	Date	Groundwater Elevation	Depth-to-Water	Top of Casing	Free Product Thickness	Screen Interval	Sand Pack Interval	Bentonite/Grout Interval
		MSL	feet bgs	feet				
MW-10	8/15/2002*	94.56	11.30	105.86	--- <sup>a</sup>	5'-20' **	4'-20' **	0'-4' **
	11/26/2002*	95.16	10.70		--- <sup>a</sup>			
	2/26/2003*	100.89	4.97		--- <sup>a</sup>			
	5/20/2003*	98.40	7.46		--- <sup>a</sup>			
	9/24/2003*	95.10	10.67		--- <sup>a</sup>			
	04/29/04	---	--- <sup>b</sup>		0.05			
	07/29/04	---	--- <sup>b</sup>		0.15			
	03/02/05	---	--- <sup>b</sup>		0.02			

### Abbreviations:

MSL = Mean Sea Level

bgs = Below Ground Surface

--- = Not Measured

\* = Data by others, not verified by Winzler & Kelly

\*\* = Well construction information provided by Clear Heart Drilling, Inc.

<sup>a</sup> = Free Product Not Present

<sup>b</sup> = Free Product Present

# WINZLER & KELLY CONSULTING ENGINEERS

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## Site-Specific Ozone Sparge Point Installation Procedures Wiggins Property 3454 Santa Rosa Avenue, Santa Rosa, California

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### 1. Objective

Install ozone sparge points.

### 2. Background

Ozone sparge points will be installed in accordance with the procedures described herein.

### 3. Personnel Required and Responsibilities

Staff Geologist: An experienced staff geologist (SG) under the direction of a California Registered Geologist (RG) or Engineer (PE) will ensure that the ozone sparge points will be properly installed and oversee the logging of the borings. The SG will be responsible for complying with the procedures regarding installation of the ozone sparge points, collection of samples, containerization of samples, and documentation.

Drilling Technicians: Drilling technicians from a drilling company holding a C-57 license will perform the biosparge point installation.

### 4. Equipment Required

- Rotary auger drilling rig
- Level C and D safety equipment
- Boring Log Form / Munsell Soil Color Charts
- Laboratory provided sample containers
- En Core® Sampler Set
- Sample labels / Indelible marker
- Disposal gloves
- Ice chest with ice
- ASTM Classification Guide
- Wash equipment
- Organic Vapor meter (OVM)

### 5. Procedure

- Winzler & Kelly will obtain all required permits prior to installing the ozone sparge points. A Site-Specific Safety Plan detailing site hazards, site safety, and control will be prepared prior to any field work. Underground Services Alert (USA) will be

notified of the planned work at least 48 hours prior to drilling.

- An OVM will be used during the drilling and sampling activities to screen for the presence of Volatile Organic Compounds (VOCs).
- The drilling stem of continuous flight augers will be properly cleaned between boreholes to prevent cross contamination between boreholes. All rinsate from the cleaning process will be contained and stored in DOT approved drums pending disposal.
- A HSA drilling rig equipped with 8-inch diameter augers will be used to install the ozone sparge points. After the desired depth has been reached the ozone sparge point is constructed by lowering a 1/2-inch diameter stainless steel riser pipe with 1 to 3 feet of 1-inch 0.020 slotted stainless steel well screen threaded at the bottom through the HSAs. After 6 inches of sand, the attached sparge assembly is lowered through the HSA annulus to the bottom of the boring. A sand filter pack is installed from the total depth to approximately 0.5 to 1 foot above the screened interval. A two-foot thick bentonite seal is then installed above the sand filter pack that prevents the grout from entering the screens. With the bentonite barrier in place, neat cement and bentonite slurry is then installed in the annulus to form a well seal.
- The ozone sparge point borings will be installed to the depth described in the project RAP. Soil samples if will be collected for lithologic descriptions only by driving an 18-inch long, split-spoon sampler at specified intervals. One 6 inch sample will be retained for field description of the lithology.
- Soil types will be classified and logged using the ASTM Visual Manual Procedure (D 2488-93) and Munsell Soil Color Charts. Using a PID Meter, the soil headspace will be field screened within a sealed sample bag.
- The lithology, moisture, density, color, sample identification, OVM measurements, and well construction details will be recorded on the boring logs as appropriate.
- Groundwater grab samples will be collected from each borehole using new disposable plastic bailers. Groundwater samples will be retrieved from the borehole and decanted from the bailer to laboratory prepared 40-mil VOAs. The samples will be labeled and stored on ice at 4-degrees Centigrade until delivery to a California Licensed environmental analytical laboratory under a fully executed chain-of-custody. Groundwater samples will be analyzed for total petroleum hydrocarbons by EPA Method 8015M.
- All ozone sparge points will be constructed using 1/2-inch diameter stainless steel tubing and 1 to 3 feet of 1-inch diameter 0.020-slotted stainless steel well screen. The screened interval will be placed as described in the RAP. A threaded cap will be attached to the bottom of the casing. Ozone sparge point construction details will be documented on the boring log.

- A sand pack of #2/12 washed sand will extend from 6 inches below the bottom of the stainless steel casing to 6 inches above the slotted well screen. The sand will be poured through the HSAs as the augers are removed from the boring.
- A seal of bentonite clay will extend a minimum of 2 feet above the sand pack. A cement/bentonite slurry, not exceeding 5 percent bentonite, will be placed by tremie pipe to 2 feet below the ground surface. The top of the stainless steel casing will be approximately 2 inches below grade. A threaded cap will be placed over the top of the casing during well completion to prevent debris from entering the well.
- The wells will be protected by 18-inch flush-mounted traffic boxes set in concrete. The tops of the traffic boxes will be set above grade with a gently sloping concrete rim. The ozone sparge point identification number will be stamped in the traffic box lid.
- Upon completion of the ozone sparge point installations, each point will be secured by bolting down the lid of the flush-mounted traffic box.

# Explanation for Winzler & Kelly Boring Logs

<b>Coarse Grained Soils</b> (more than half of soil > No. 200 sieve)	<b>Gravels</b> (More than half of coarse fraction > no. 4 sieve size)		<b>GW</b>	Well graded gravels or gravel-sand mixtures, little or no fines	
			<b>GP</b>	Poorly graded gravels or gravel-sand mixtures, little or no fines	
			<b>GM</b>	Sandy gravels, gravel-sand-silt mixtures	
			<b>GC</b>	Clayey gravels, gravel-sand-silt mixtures	
	<b>Sands</b> (More than half of coarse fraction < no. 4 sieve size)		<b>SW</b>	Well graded sands or gravelly sands, little or no fines	
			<b>SP</b>	Poorly graded sands or gravelly sands, little or no fines	
			<b>SM</b>	Silty sands, sand-silt mixtures	
			<b>SC</b>	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
	<b>Fine Grained Soils</b> (more than half of soil < No. 200 sieve)	<b>Silts and Clays</b> <b>LL = &lt; 50</b>		<b>ML</b>	Inorganic silts and very fine sands, rock flour, silty fine sands or clayey silts with slight plasticity
				<b>CL</b>	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			<b>OL</b>	Organic silts and organic silty clays of low plasticity	
<b>Silts and Clays</b> <b>LL = &gt; 50</b>			<b>MH</b>	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
			<b>CH</b>	Inorganic silts of high plasticity, fat clays	
			<b>OH</b>	Organic clays of high plasticity, organic silty clays, organic silts	
<b>Highly Organic Soils</b>			<b>Pt</b>	Peat and other highly organic soils	

**Grain Size Chart**

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size In Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4	76.2 to 7.76
	3" to 3/4"	76.2 to 4.76
	3/4" to No. 4	19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200	4.76 to 0.074
	No. 4 to No. 10	4.76 to 2.00
	No. 10 to No. 40	2.00 to 0.420
	No. 40 to No. 200	0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

**Relative Density (SPT)**

SANDS AND GRAVELS	BLOWS/FOOT
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	32 - 50
VERY DENSE	OVER 50

**Consistency (SPT)**

SILTS AND CLAYS	BLOWS/FOOT
VERY SOFT	0 - 2
SOFT	2 - 4
MEDIUM STIFF	4 - 8
STIFF	8 - 16
VERY STIFF	16 - 22
HARD	OVER 32

- ✕ Initial water level measured during drilling (date in *italics*)
- ▼ Static water level measured after well development (date in *italics*)
- ✕ Depths where soil samples were recovered

## SERVICE AND MAINTENANCE OF THE PULSEOX 100

(Provided by Manufacturer)

This section outlines the operational and scheduled maintenance requirements.

Typical operational and preventative maintenance activities for the PulseOx 100 system are detailed in Table 8.1. For further information contact APPLIED regional operations contact or home office.

Activity	Weekly *	Monthly **	Quarterly	Semi	Annually
Record operating data on log sheet	X	X	X		
Inspect for ozone gas leaks	X	X	X		
Calibrate ozone generator performance			X		
Check PSA intake filters		X	X		
Check air compressor intake filter and filter regulator		X	X		
Clean dust from cabinet		X	X		
Replace O2 compressor diaphragm				X	
Replace PSA compressor Diaphragms				X	
Check Injection valve operation	X	X	X	X	
Replace O3 sensor					X
Check all safety relief valves		X	X		
Inspect/tighten low voltage wiring terminations	X	X	X		
Inspect/tighten power wiring terminations			X		
Replace O3 generator					5X

Notes:

\* = Weekly start-up requirement for the first month. Additional days as needed to ensure proper and safe operation.

\*\* = Bi-Monthly system visits, tentatively scheduled for the 1<sup>st</sup> and 15<sup>th</sup> of every month.

Routine weekly and bi- monthly service shall include the following tasks at the minimum:

- A. Inspect and verify all process pressures and flow rates as under proper operating conditions. Adjust process controls, changing process pressures and/or flow rates as appropriate, in order to conform to latest field conditions and/or in response to manufacture's instruction.
- B. Inspect all piping, valves, and connections to ensure proper tightness.
- C. Clean intake air filters on air compressor.
- D. Clean dust from screen on ozone generator.
- E. Inspect all electrical components to ensure proper operating conditions. I Inspect & tighten control wiring if necessary.
- F. Inspect process cycling and ensure compliance with operation program. Adjust operation program in order to conform to latest field conditions and/or in response to client's instruction.
- G. Perform scheduled maintenance and replace existing components per Table
- H. Document field activities and findings on field log with date, time, and original signature of service provider.
- I. Replacement parts listed in table 8.2

# PulseOx 100

## SCHEDULE FOR MANDATORY PART REPLACEMENT

	COMPONENT	MANDATORY REPLACEMENT FREQUENCY	PART NUMBER	SUGGESTED SUPPLIER	APPROXIMATE COST
Thomas Air Compressor	2 inlet Air Filters	4000 HR	C62053	NorCal	\$5.48
	Minor Service Kit, piston rings, & springs, skirt ect	8000 HR	C62050-P	NorCal	\$129.83
	Valve assembly service kit	8000 HR	C62051	NorCal	\$95.70
	Major Replacement Kit , Piston & Rod assembly	12000 HR	C62052-P	NorCal	\$447.83
	Check and drain filter regulator	MONTHLY			
	Replace filter regulator 5 micron filter element	4000 HR	FRP-96--729	NorCal	\$4.40
SeQual PSA	Air Filters	4000 HR	C62053	NorCal	\$5.48
	Compressor rebuild	5000-12000 HR	Pt.No. 3197	Sequal	\$45
O3 Generator	Replace generator	5 YEARS			
O2 Compressor	Replacement Hypalon diaphragm	4000 HR	608169	NorCal	\$4.74
	Rebuild Kit (gasket, flapper valve, Hypalon diaphragm	4000 HR	SK107H	NorCal	\$18.75
	Replacement compressor with Hypalon Diaphragm	4 YEARS	107CAB18-XX	NorCal	\$158.07
Electical	replace PLC batterys	16000 HR			\$60.00
	replace O3 sensor	1 YEAR		EcoSensor	\$50.00

## **ECO SENSORS, INC.**

3-03.2

# **OEM OZONE CONTROLLER**

## **Model OEM-2**

## **INSTRUCTIONS FOR USE**

### **GENERAL**

The model OEM-2 is a system to control ozone generators and alarms based on an adjustable ozone concentration set point. It is designed to work with plug-in sensor modules for 0-0.1 ppm, 0-1 ppm, and 0-10 ppm. These are specified when ordering by putting the ppm range after the model number. For example, a 0.1 ppm OEM-2 board system would be OEM-2-.1 and the replacement sensor module for it would be SM-1-.1. These same sensor modules also work in our OEM-1 boards, which have features such as being powered by 110/220 VAC. The sensors modules can also be located at a distance from the OEM-2 boards by 2 or 8 meter cables. These are readily available DIN M/F 5 pin extension cables.

One component of the OEM-2 system is the base board which incorporates the power supply, final signal processing, set-point controls, and the output relay. The other component is the sensor mounted with its associated electronics in a cylindrical DIN plug. This is precalibrated in our lab so that the sensor module and main board module together work as a calibrated system. If the sensor module is damaged, it is simply replaced by another precalibrated module.

The design incorporates hysteresis and time delay (set at 8 seconds except for special orders) to eliminate chatter and other excessive interactions between the sensor and generator. The SPDT relay contacts will handle up to 5 amps at 250 volts. The OEM-2 should not be used outdoors or in the presence of NO<sub>x</sub>, nitric acid, acid gases, or halogen compound fumes.

Allow warm-up according to the table below. At least 24 hours is recommended if the system hasn't been used for a week or so. This is because the sensor can absorb VOCs when it is not in use.

### **OPTIONS**

In addition to the basic switching function, the OEM-2 may be ordered with the following:

1. An analog voltage output which is a buffered version of the sensor module signal. Again, one volt of output represents the calibration of the sensor module.
2. A 4-20 mA current output which is proportional to the sensor module's output.
3. A driver circuit for an audible alarm, including an acknowledge switch input to silence this alarm. The alarm will turn on again after the ozone level drops below the switch threshold and then rises again.
4. 2 and 8 meter extension cables are available for remote mounting of the sensor module. Note that the use of these cables unavoidably introduces a small offset voltage, which is added to the sensor output. This will raise the 'zero' point by an amount which is not usually significant.

## INSTALLATION

### CAUTION!

It is best to bench test the board with an AC adapter 12 VDC supply (see below). Do not let solder connections on the OEM-1 board short circuit to any metal surfaces.

The OEM-2 should be attached to your equipment (such as inside the ozone generator) by four mounting holes. Select four that align with your equipment and which stabilize the OEM board. The board surface on the solder side should be kept at least 6 mm (1/4") from any metal surface. The OEM-1 board should be wired to your power by the terminal block terminals 2 and 3 for 110 V 60 Hz or 220 V 50 Hz according to the power transformer wiring/jumper diagram found in these instructions. Alternately, you can power the unit by 12 V DC via jack J2. This low voltage power option was provided especially for bench testing the OEM-1 without exposing personnel to high line voltages. The Eco Sensors P-20 AC adapter (a purchase option) can be used to provide 12 VDC when 120 VAC 60 HZ is available. For 220 V 50 Hz power, you will have to purchase an adapter locally with specifications according to our Tech Note P-101.

## CONNECTIONS

Along one edge of the OEM-2 board are three 3-position terminal blocks. These are labeled in silk-screen on the board as TB-1, TB-2 and TB-3.

TB-1, located at the front of the board (i.e. closest to the sensor module) is the relay output, which is capable of switching up to 5 amps at 250 V.

~~TB-2 provides the 4-20 mA and 0-2 Volt analog outputs, if these options have been installed.~~

~~TB-3, farthest from the sensor module, is the board's power input. Any supply from 12-24 Volts AC or DC is acceptable, with a current drain of approximately 75-100 mA. To operate the board from AC power, connect the supply leads to the two outside screws of TB-3. DC power may be applied between either of the outside screws and the center screw (the center screw is board ground and MUST be the negative side of the DC supply). Note that when powered from AC, the board's circuit ground is NOT connected directly to either supply lead.~~

For convenience, a DC power input connector is located between TB-2 and TB-3. An Eco Sensors model P-20 power adapter (or equivalent 12-18 VDC source) may be plugged into this connector to power the board. Do NOT use this option when power is being applied via TB-3.

## WARM-UP

When the generator or other equipment is turned off, if possible, it is best to wire the units so that the OEM-2 board is always powered. The sensor will stay heated and burn off any chemicals it would otherwise absorb. When the ozone generator or other equipment is turned back on, the OEM board is ready to respond immediately and accurately.

Otherwise, warm-ups are required. Recommended warm-up times are:

<u>Time Since Last Powered</u>	<u>Warm-up Time</u>
1 minute - 3 days	10 minutes
3 - 7 days	1 hour
More than 1 week	24 hours

If the sensor is easily accessible, the warm-up time can be minimized by checking for full response by an ozone generator of known output. The Eco Sensors OG-2 Ozone Source Calibrator is a portable battery-operated source which is designed to check for response at 0.1 ppm.

### OPERATION

The OEM-2 is calibrated at the factory by comparison with a NIST traceable UV analyzer. Lower detection points can be set by the calibrated dial pot R-14 on the main board. Its numbers represent percentage of ppm. For example, 50 on the dial pot is 50% of 0.1 or 0.05 ppm (50 ppb). The calibration as a percentage of 0.1 ppm should be within 20% over 0.03-0.10 ppm. We do not recommend operating with a set point for detection below 0.03 ppm because too many chemical, atmospheric, and electronic variables can collectively make lower set points inaccurate and unreliable. ~~A rough check of the instrument's functionality and calibration in abusive environments should be done every three months.~~ This can be easily done with our model OG-2 Ozone Source Calibrator if the check is at 0.1 ppm.

### ADJUSTMENT

Before attempting to select a set point, the OEM board must be powered on for at least 10-15 minutes. This is the time required for sensor elements to fully warm up and equilibrate to the local ambient conditions. If the board has not been run for a very long time (weeks or months), additional time may be required for maximum stability and accuracy.

When power is applied to the OEM-2, a green LED (D3) located directly behind the sensor module connector is illuminated. This is simply an indication that power is available and that the on-board power supply is working.

A second green LED (D2) is located adjacent to the set point potentiometer (R14) and indicates whether the level of ozone currently being sensed is above or below the steeping. This LED is illuminated when the detected level is below the steeping and goes out when the level exceeds this threshold. Note that the hysteresis of the comparator circuit makes it impossible to turn off D2 by setting the threshold to zero when the ambient ozone level is extremely low. At higher levels (up to the sensor module's calibration point), turning the steeping pot up and down should make D2 turn on and off.

A yellow LED (D1) located behind the sensor module connector indicates the state of the board's relay. When this LED comes on, the relay is active. Note that there is a delay of 6-10 seconds between D2 and D1, so it is possible to have both LEDs on or off for short periods when the ozone level crosses above or below the set point.

### ALARM CIRCUIT

If the optional alarm circuit is installed, there will be a header, J3, with four pins (0.025" square, on 0.100" (2.5 mm) centers) mounted directly in front of relay K1. When viewed from the front of the board, pin 1 of this header is located closest to terminal block TB-1 and pin 4 is closest to the center of the board. An audible or visual alarm may be connected between pins 1 and 2 of this header (pin 1 is the +12 Volt supply, 50 mA max, pin 2 is pulled low to turn on the alarm device).

An acknowledge button may be connected between pins 3 and 4 (pin 4 is circuit ground). When this button is pressed, it will silence the alarm. The alarm also goes silent when the ozone level falls below the set point value. If the ozone level again rises above the set point, the alarm will again come on.

## CARE AND USE OF THE SENSOR

The sensor, which protrudes from the end of the sensor module, is a heated metal oxide (HMOS) sensor. It incorporates the latest IC and micromachining technology in its construction so it is very stable and rugged. It can easily lose its calibration - at least until it is burned-in again - if it is exposed to any VOC chemicals and fumes, especially if it is exposed to these when it is not powered. These harmful fumes and chemicals include grease and oils, finger oil, strong deodorants, solvent fumes, sulfur compounds and the like. The sensor cannot be user calibrated. It should be recalibrated by an authorized distributor or by the factory. If it is damaged, a new sensor module must be purchased.

The sensor module can be plugged into the main board directly. It can be extended up to about 8 meters using standard DIN M/F extension cables (not mini-DIN) available from most computer supply distributors.

## CALIBRATION

The sensor is calibrated in the sensor module by comparison with an NIST traceable UV analyzer. The accuracy is within 20% at full sensor response.

## AC ADAPTER

For using low voltage power input, such as for bench testing, an AC adapter that delivers 12 volts at 300 mA should be used. Its output plug to fit our jack should have the 5.5 mm/2.5 mm female specification, jack center pin +. These are widely available worldwide. For more complete specifications see our Tech Note P-101.

## SPECIFICATIONS

**Sensor:** Heated metal oxide semiconductor.

**Range:** 0-0.1 ppm, 0-1 ppm and 0-10 ppm available. Accuracy: 20%.

**Sensitivity:** As low as 0.02 ppm for the 0.1 ppm module, 0.1 ppm for the 1 ppm module, and 0.3 ppm for the 10 ppm module. These sensitivities will decrease if sensor module extension cables are used.

**Response time:** Within 10's of seconds.

**Turn-on, turn-off time delay:** 8 seconds standard. Other times by request.

**Temperature and humidity range:** The calibration is only valid for normal room temperature and humidity. The circuit does not include temperature or humidity compensation devices.

**Supply voltage required:** 12-24 VDC or AC, 250 mA.

**Relay ratings:** SPDT non-latching. Contacts: 5 amps at 250 volts AC.

**Size of main board:** 83 X 83 mm (3.25" X 3.25"). Requires 23 mm (.875") clearance from top surface of board and 6 mm (.250") clearance from bottom surface of the board.

**Main board mounting:** By 4 3.5 mm screws (or 6-32 screws).

**Sensor Module:** 16 mm (dia) X 45 mm (length), (.62" X 1.75"), 10 g (0.3 oz).

**Shipping weight:** Both modules and 2 meter sensor extension cable, no adapter: 454 g (1 lb)

## PRECAUTIONS

- Read all instructions in this manual.
- Review safety procedures in testing and operating this system.
- Call a qualified electrician if you have any doubts about voltages, wiring, electrical codes and practices, etc.
- Keep the boards and sensor dry. Never let water or other liquids into the system.
- Do not drop the boards. Damage may not be immediately obvious.

- Operate this system in areas of normal room temperature. Operation at lower temperatures, such as warehouses or refrigerated areas, should only be attempted after testing in the proposed environment for correct and reliable operation.
- Do not attempt to service the instrument yourself.
- Do not operate this system or rely on its operations where there are high concentrations of:
  - Chlorine or other halogen compounds
  - Sulfur compounds.
  - Nitrides of oxygen (NOx).
  - Urine residues and ammonia compounds.
  - Acid gases and vapors such as sulfuric or nitric acid fumes.

When in doubt, operate the system at least 24 hours in your worst case environment.

### **LIMITED WARRANTY**

This product is warranted against defects in materials and workmanship for one year following the date of purchase by the OEM. This warranty does not include damage to the product as a result of misuse, damage, modifications or alterations, and it does not apply if the instructions in this manual are not followed.

If a defect develops during the warranty period, Eco Sensors at its election will repair the product or replace it with new or reconditioned product of equivalent quality. In the event of replacement with a new or reconditioned product, the replacement will continue the warranty of the original model.

To return this system or any module of it, call your distributor or OEM. OEMs and distributors call Eco Sensors at (800) 472-6626 or e-mail at: [sales@ecosensors.com](mailto:sales@ecosensors.com) to receive return instructions and a Return Goods Authorization (RGA) number.

Except as provided herein, Eco Sensors makes no warranties, express or implied, including warranties of merchantability and fitness for a particular purpose. Eco Sensors shall not be liable for loss of use of this instrument or other incidental or consequential damages, expenses or economic loss, or claims for such damage or economic loss.

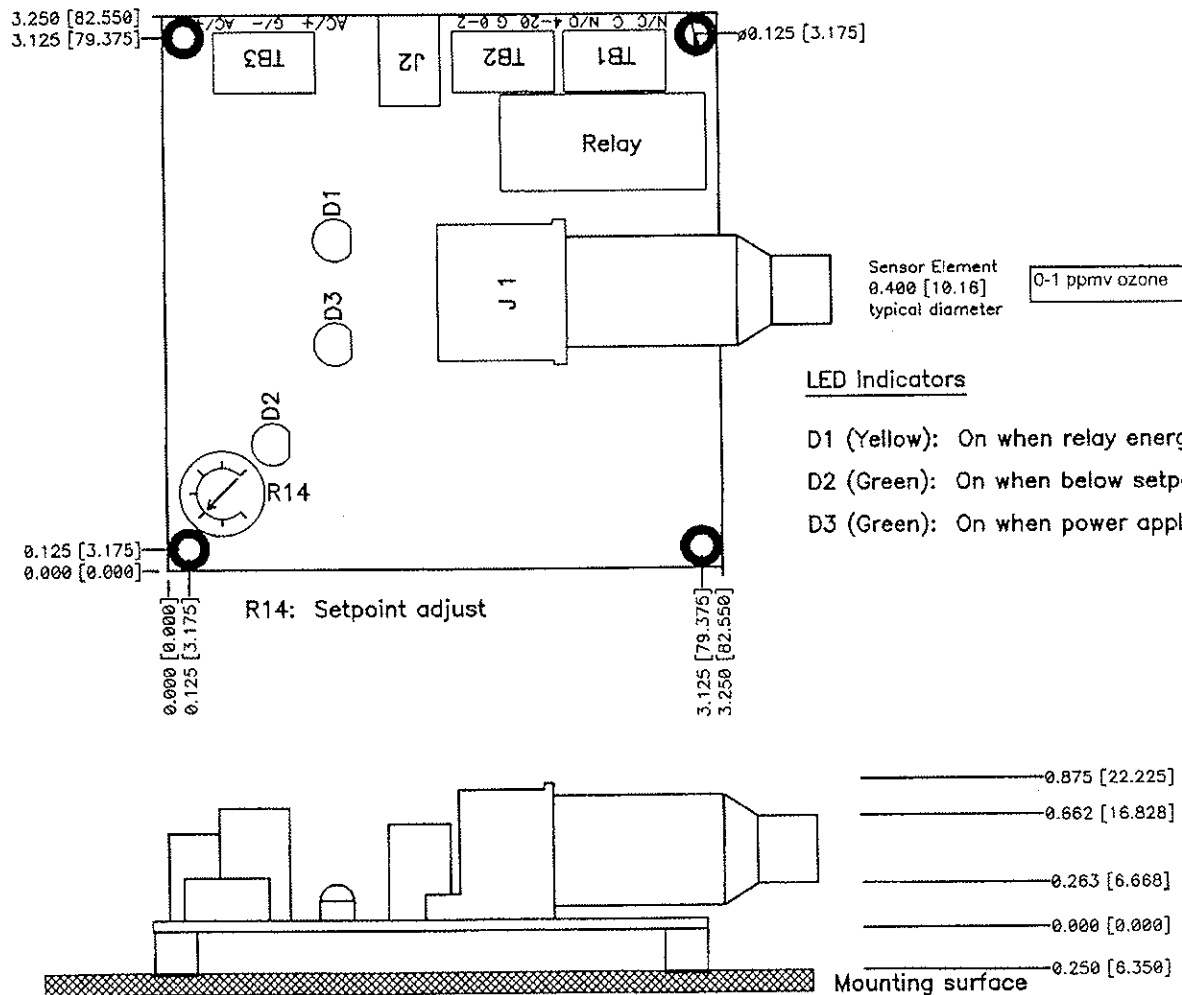
RECORD YOUR SERIAL NUMBER HERE \_\_\_\_\_

KEEP THIS MANUAL AND WARRANTY FOR YOUR RECORDS.

Eco Sensors is a registered trademark of Eco Sensors, Inc.

# OEM-2 Ozone controller board application notes

Eco Sensors, Inc. Santa Fe, NM. USA



## LED Indicators

- D1 (Yellow): On when relay energized
- D2 (Green): On when below setpoint
- D3 (Green): On when power applied

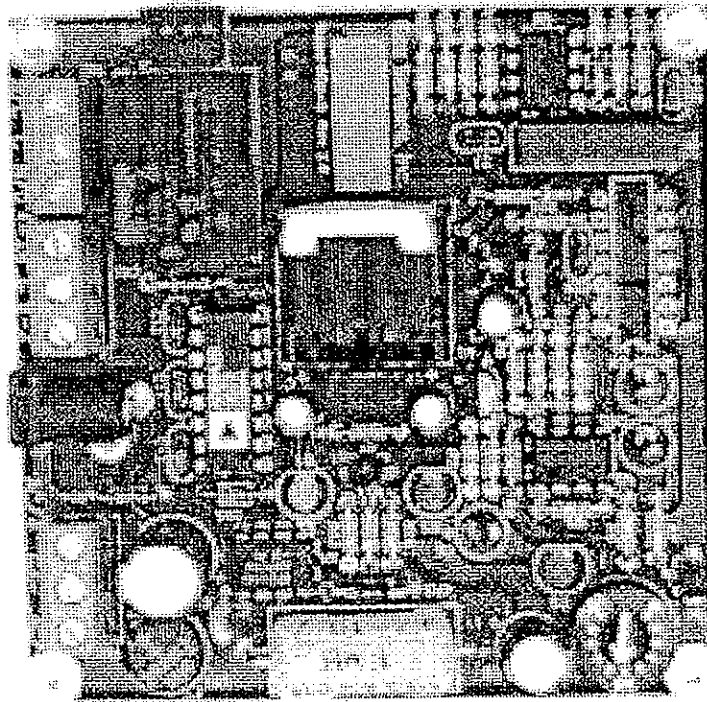
## Installation Notes

- Line voltage is present on the board around terminal block TB1. Allow at least 0.250 inches (6.35 mm) clearance behind board.
- All mounting holes are connected to circuit ground and also to position 1 of terminal blocks TB2 and TB3.
- Maximum component height above board mounting surface is 0.875 inch (22.25 mm).
- Sensor plug is shown mounted directly to main circuit board, however extension cables may be used for remote mounting.
- Potentiometer R14 controls detector switching threshold. In standard configuration, 100% of scale equals 0.1 PPM.
- LED D1 (yellow) is illuminated when detected level is greater than threshold setting and relay is energized (after time delay).
- LED D2 (green) is illuminated when detected level is less than threshold setting. Responds quickly to changes.
- Connector J2 may be used to supply DC power (12 Volts nominal, center pin positive) to board for bench testing to reduce shock hazard.
- Mounting holes are 0.125" / 3.175 mm diameter. Maximum outer diameter for screws, standoffs, washers, etc. is 0.25 inch / 6.35 mm.

## Terminal Block Connections:

- TB1: Relay contacts (5 A @ 250 VAC MAX).
- TB2: 0-2 Volt and 4-20 mA analog outputs (optional).
- TB3: Board power supply input. 14-24 V AC/DC.

Note: 0-2 Volt and 4-20 mA analog outputs must be configured for desired range during board assembly. Sensor modules are also set for desired measurement range during assembly and calibration.

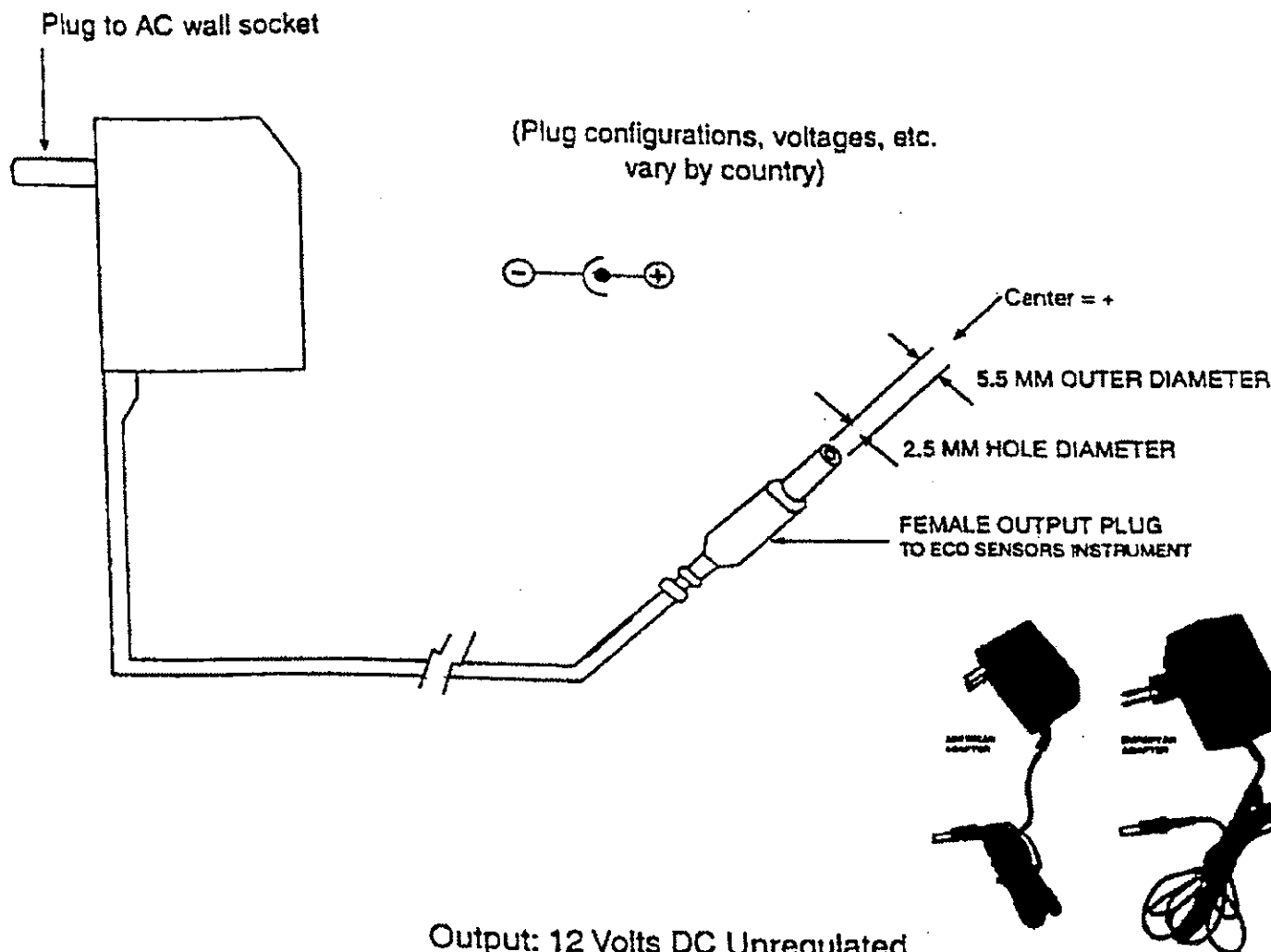




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## Tech Note P-101

### AC Adapter for Eco Sensors Equipment



Output: 12 Volts DC Unregulated  
300-500 mA

Female output plug, 5.5 mm/2.5 mm, Center +

This size AC adapter is found in electronic stores and distributors worldwide. The adapters vary from country to country by plug geometries, voltage input, HZ rate, and conformity to local codes. The output plug which mates with our instruments is an international standard. While the Eco Sensors instruments will work with a 300 mA output adapter, the 500 mA size commonly available is preferred so that the adapter will run cooler and will have the additional capacity available to power the EE-2 Environmental Enclosure, RAP-7800 Alarm Panel, and other accessories. Eco Sensors only stocks the 120 volt 60 Hz North American size adapter.